

# Plastic Reefs

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Historic practices of burying or burning litter was sufficient for inert or biodegradable waste.

However, the continued and rapid growth of synthetic material usage has now changed this.

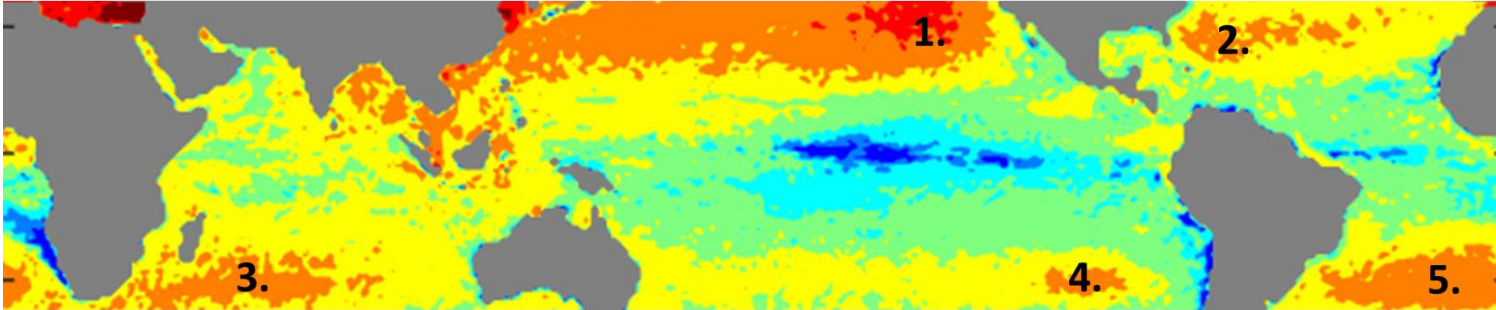
A paradigm shift is now needed to address this concern.

The surface layer of the world's oceans is estimated to contain more than five trillion items of litter (Lavers and Bond 2017).

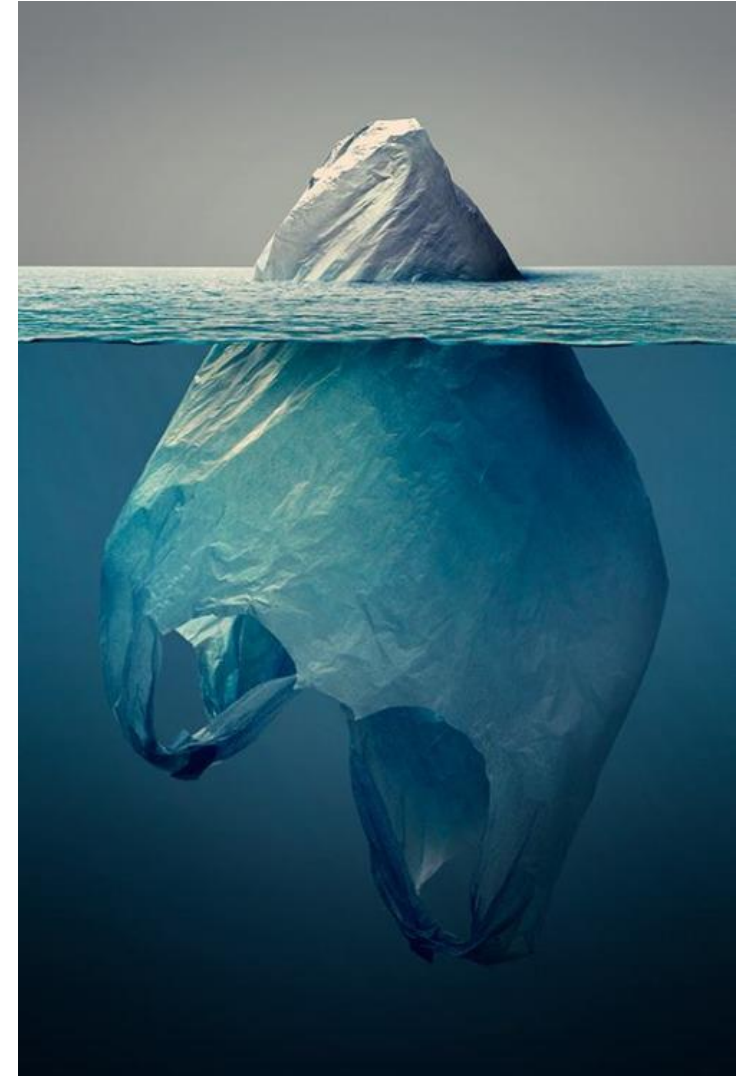
but even as far back as 1972 over 6.4 million tonnes were thought to be present (Jambeck et al. 2015).



# A Circular Issue



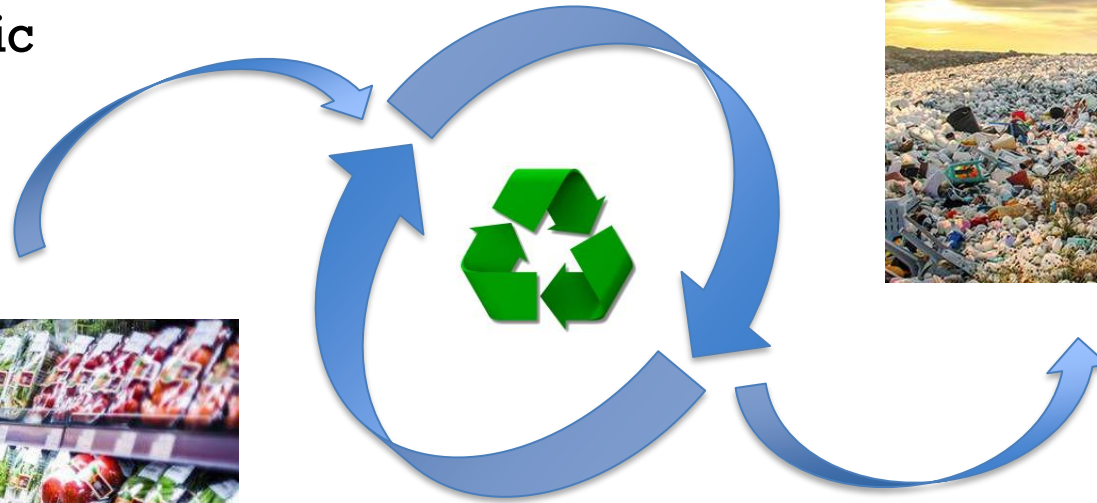
Yet the surface waters are just the tip of the iceberg.



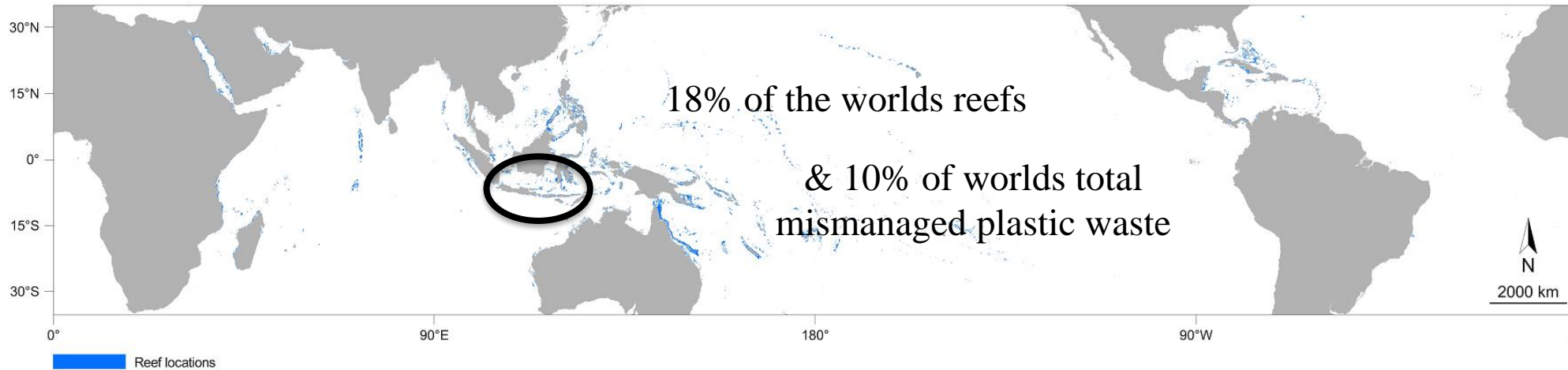
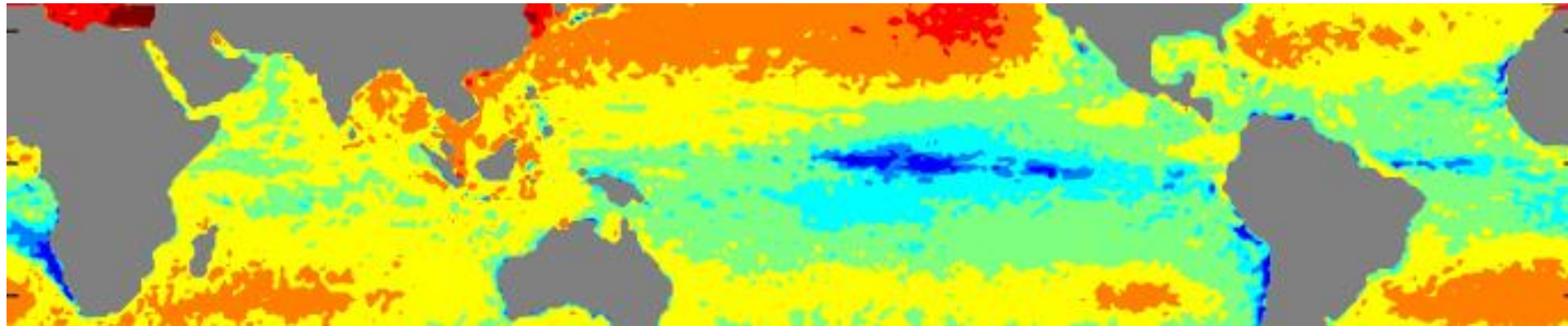
<b>Sources</b>	<b>Tonnage of plastics estimated to be generated (thousand tonnes per annum)</b>
Rivers/land run off – land based	9000
Direct dumping	1500
Fishing gear	640
Lost cargo	600
Vehicle tyre dust	270
Pellet spills	230
Road and building paint	210
Textiles	190
Cosmetics	35
Marine paint	16

# A Circular Issue

In 2010 an estimated 275 million metric tonnes of plastic waste was generated by 192 coastal countries



Unfortunately many of the countries which 'miss-manage' their waste – also have large tracts of reef



**We can try and split the issue into three main plastic ‘types’ all of which have been shown to be associated with reef environments;**

Macro-plastics

Lost and abandoned fishing gear or ‘ghost gear’

Micro-plastics or Nano-plastics



# Macro-Plastics

Unsurprising that it has been said that all organisms on earth are likely to have encountered plastics at some point.

Indeed over 700 species have been recorded as having some sort of direct interaction.

The majority of plastic related impact on organisms has been demonstrated at the sub-organismal or organism level.

Likely because much of the science comes from lab based studies.

However, there are numerous issues with these studies and many contradict each other.



The scale of the issue ranges from 0.9 to 26.6 plastic items per 100 m<sup>2</sup> across the Asian Pacific region (Lamb et al. 2018).

Plastic abundance largely correlates with population densities – however ‘pristine’ areas are also suffering significant loads:

Maldives 35.8 particles per m<sup>2</sup>

Henderson Island 37.7 million pieces (Lavers and Bond 2017).

Contact with plastics shown to increase incidence of coral disease from 4% to 89% (Lamb et al 2018).

# Lost and Abandoned Fishing Gear

Vast majority of fishing gear in use today is made from nylon, polyethylene and polypropylene.

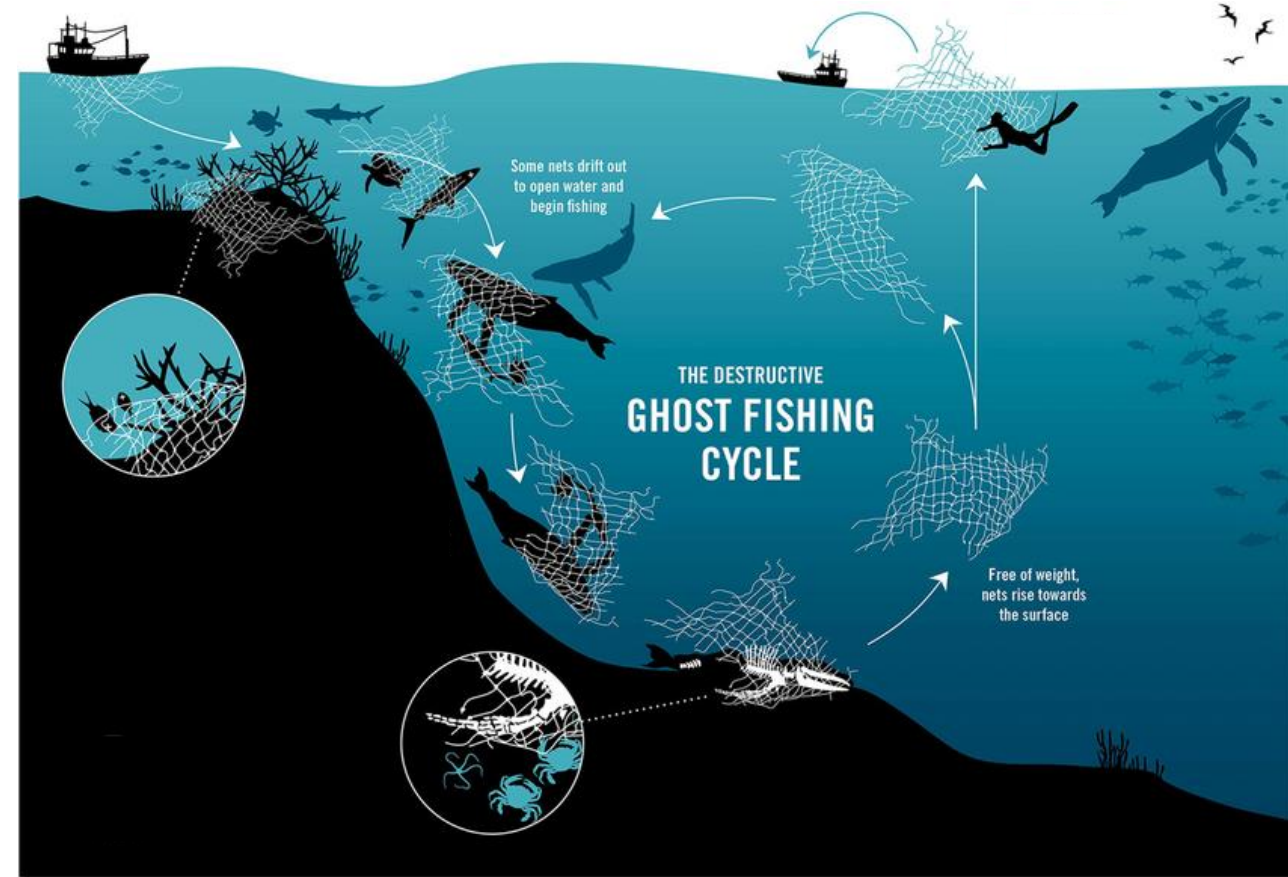
46% of the plastic associated with the 'Great Pacific Garbage Patch' comprises of fishing gear (Lebreton et al. 2017).

The issue around ghost gear has been well documented (Stelfox, Sweet et al. 2016).

Tackling ghost gear focuses on gear retrieval.

Whilst commendable, these efforts do little to prevent the issue in the first place.

Focus should therefore be more on preventative measures i.e. tackling the issue before the gear reaches the sensitive habitats.



# Micro-Plastics

Accumulating in the oceans for the last four decades.

But, quantity is relatively low;

2 pieces per 11,000 litres – GBR (Hall et al. 2015)

Worry over accumulation via food webs!

Fibres are the most commonly encountered microplastic and these form tangled balls in the guts of reef dwelling organisms (Watts et al. 2015).

However, microplastics appear to have no significant effect on growth rates, body condition and behaviour of the organism studied (Critchell and Hoogenboom 2018).

Furthermore, caution highlighted with background contamination in lab trials (Hermsen et al. 2017).



# Policy Decisions and Measurable Impact

Science should always feed into policy, but as is often the case this does not always happen.

Argument for long term monitoring programs to be put in place **before** active measures gain traction in order to measure impacts.

As mentioned we need to address the issues associated with **consumer demand** and **waste management** before funding large scale clean up campaigns (or at least, at the same time).

We do have enough scientific evidence (and common sense) to tell us that plastics are 'bad news' for any given environment and/or organism.

That said, there are other more 'stressing' stressors than the plastic issue (*in my opinion*).